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TOWARDS A MULTI-CRITERIA DECISION SUPPORT FRAMEWORK FOR CUSTOMER RELATIONSHIP MANAGEMENT SYSTEM SELECTION

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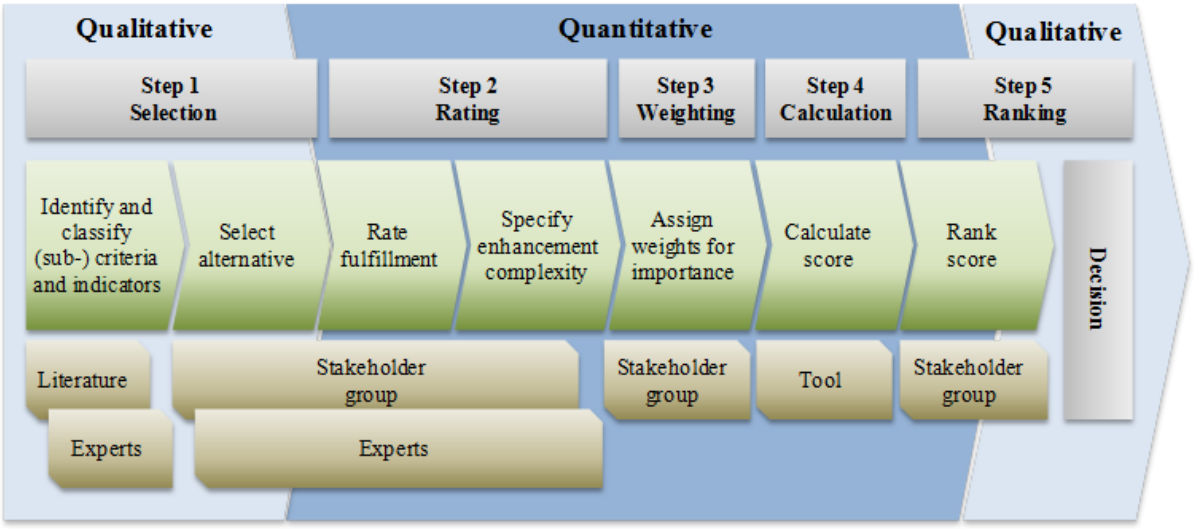

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TOWARDS A MULTI-CRITERIA DECISION SUPPORT FRAMEWORK FOR CUSTOMER RELATIONSHIP MANAGEMENT (CRM) SYSTEM SELECTION

Abstract

Selecting suitable customer relationship management (CRM) systems is a decision problem with economic, behavioural, technical and functional aspects. It is mandatory to base this type of IT investment decision not only on best practices experience, but primarily on robust data so that the final choice is based on concrete arguments. A CRM system selection framework is presented and discussed that specifically focuses on attributes for CRM evaluation with multi-criteria decision support. This framework is based on findings from a literature review of evaluation techniques for system selection and three subsequent CRM expert evaluations defining the CRM system evaluation criteria. A process is suggested on how to apply this framework to CRM system selection projects.

Keywords: CRM system selection, CRM software selection, CRM system evaluation tool, CRM system selection framework, multi-criteria decision support, weighted scoring method, literature review.

1 Introduction

The market for software packages and diverse IT solutions has significantly increased in recent years, covering both vertical solutions and integration topics. Identifying and selecting the most suitable solution for an individual company has become a complex multi-criteria decision problem. The main decision parameters include adaptability of the business processes, flexibility in terms of market and strategy changes, and IT architecture fit. Selecting the appropriate customer relationship management (CRM) system can be described as a multi-criteria decision making (MCDM) problem. The main difficulty of multi-criteria problems is a mathematical description, as there is no objective solution (Vincke, 1989). MCDM describes the evaluation of a - often restricted - number of alternatives, considering multi-criteria (Yoon and Hwang, 2009). It also supports a decision-making process if those criteria are unmanageable and difficult to rank, helping users choosing the best alternative (Le Blanc and Jelassi, 1989). Evaluation techniques that translate information into comparable numbers provide a mathematical bridge for the underlying qualitative problem.

One evaluation technique that is frequently discussed in literature is the weighted scoring method (WSM), which is the focus for CRM system selection in this paper. CRM solutions range from simple address and activity management applications to integrated software packages that link front office and back office functions (Chen and Popovich, 2003). This means that there is a multitude of different characterizations for CRM, which in turn implies selecting a particular one requires methodological support. Although a number of approaches to WSM have been discussed in different areas of information system research (ISR), a framework for CRM system selection (CRMSS) has not been proposed yet. The aim of this study is to answer the following research question: Is WSM a feasible evaluation technique to support CRMSS?

The paper introduces the topic in section 2 by providing a theoretical background for evaluation techniques, with a focus on WSM. Section 3 shows the current research status, giving an overview of applying WSM in the ISR context and a description of how WMS is applied in each case. In section 4, the results are used as a basis to apply WSM within the context of CRMSS. Each step of the decision making process provided in sub-sections of section 4. Section 5 discusses the results including limitations and recommendations regarding the presented multi-criteria decision support framework. The paper closes with conclusions and an outlook.

2 Theoretical Background

In social science there are two research approaches, quantitative and qualitative, and they differ significantly. The qualitative approach constructs social reality by focusing on interactive processes and events. It focuses on a few cases, and these are constrained by the situation. The quantitative approach measures objective facts that focus on variables, using many cases and statistical analysis (Neuman, 2006). Although the investigated problem is qualitative, the decision-making process includes both qualitative and quantitative steps (see Figure 1) (Naumann and Palvia, 1982).

There are several techniques for supporting a decision-making process. Incorporating preferences is a key aspect of a decision making process framework (Bouyssou et al., 2006; Vincke, 1989). This paper focuses on an evaluation technique that supports the analysis of qualitative data to gain a more clear picture of a preferred solution. With evaluation techniques, researchers use numeric variables to code information into machine-readable form (Neuman, 2006). The most cited techniques besides WMS include the analytic hierarchy process (AHP) (Colombo and Francalanci, 2004), the hybrid knowledge based system (HKBS), the superiority and inferiority ranking method (SIR), SWOT (strengths, weaknesses, opportunities and threads), and fuzzy methods (Jadhav and Sonar, 2009; Bouyssou et al., 2006; Lee et al., 2004). This section describes the technique the authors decided on in further detail.

WMS is defined as follows (Lin and Nagalingam, 2000; Jadhav and Sonar, 2009):

- It is a systematic subjective quantification process.
- It evaluates alternatives according to a performance measurement scale.
- It supports only quantitative parameters. For qualitative parameters, other evaluation techniques are used, e.g. AHP or HKBS.
- All alternatives need to be rated separately before the final score is calculated.
- No extra effort is required to calculate a final score if the number of valuation criteria changes (if criteria are defined initially). Changing the weights has an effect on the final score and should not be done after the final score has been determined.
- Limitations of WMS are:
  - Knowledge and experience reuse are not supported
  - Specifications of user requirements are not supported
  - Rank reversal problems are not supported
  - An indication of the level of requirement fit are not supported
- Preferences are factored into account for company specific requirements.

As can be seen in section 3, WMS has been widely discussed in literature and varies in some aspects, although the basic characteristics described above always apply. The least common denominator of the procedure explained in the literature is: Initially, a list of criteria is defined to determine the decision problem. Next, a list of alternatives for problem solving is created. All alternatives are rated according to their fit to each criterion. This step must be finished before weights are assigned to the criteria. A weight indicates the importance of a criterion to an individual situation. The scale for weights is not generally defined, as it varies according to the decision problem. The criterion that is perceived to be most important is assigned the highest weight. Finally, an overall score is calculated by adding the results of the relevant criteria. The current research status on WSM is presented in the next section.

3 Overview of Current Research Status

A literature review was conducted on the four major research databases in the field of ISR: ACM, IEEE, Science Direct, and SpringerLink. The authors used combinations of “evaluation technique”, “weighted scoring method”, “system selection”, “software selection” and “decision making” as search terms. The following table displays the literature found that addresses WSM, the area in which it is used and how it is applied.

Authors	Area	Calculation
Collier, Carey, Sautter, and Marjaniemi (Collier et al., 1999)	Data mining evaluation	1 Screen for alternatives to reduce number of tools in scope 2 Identify additional selection criteria 3 Weight selection criteria (0-100%) 4 Score each alternative against a reference tool (scale 1-5) 5 Review scoring evaluation
Goyal and Sharma (Goyal and Sharma, 2010)	Data mining effectiveness evaluation	1 Extract and rate important criteria (5 point scale; mean value greater or equal than 4 is treated as important) 2 Assign weights to criteria according to importance (percentage of variance method; total weight within each category = 100%) 3 Calculate and rate score (1 poor – 5 excellent) 4 Evaluate alternatives using score rating
Le Blanc and Jelassi (Le Blanc and Jelassi, 1989)	Decision Support Systems (DSS) selection	1 Screen alternatives and criteria (n criteria versus m alternatives) 2 Weight criteria importance (scale 1-3) 3 Rate completeness of requirements per criterion (scale 0-3) 3 Calculate evaluation matrix (weights x requirements met) 4 Calculate total scores and percentages of requirement satisfaction (minimum 80%) 5 Divide each result by costs
Lee, Shen and	Fuzzy multiple	1 Build fuzzy decision matrix (incl. weights and criteria)

Chih (Lee et al., 2004)	criteria decision making	2 Create strength and weakness matrix 3 Calculate fuzzy weighted strength and weakness indices per alternative 4 Calculate the total performance indices and aggregate them 5 Rank all alternatives
Jadhav and Sonar (Jadhav and Sonar, 2009)	Comparison of evaluation methods for software selection	1 Select criteria and alternatives 2 Assign importance score to each criterion (range not specified) 3 Assign performance for each criterion and alternative 4 Calculate decision matrix
Naumann and Palvia (Naumann and Palvia, 1982)	Development tool evaluation	1 Identify functions (objectives) 2 Weight functions using the Delphi technique 3 Develop criteria to evaluate functions 4 Assign values to each criterion 5 Relate each technique 6 Calculate total score
Perez and Rojas (Perez and Rojas, 1999)	Workflow-type software evaluation	1 Identify indicators grouped into categories 2 Apply qualitative scale to each indicator to score the availability of a functionality 3 Define weights for usability 1-10 4 Calculate weighted average for each indicator 5 Calculate weighted average by each category 6 Multiply weighted average by category with the weight from step 3, add up all values and assign recommendation (values in 6 categories with values from 1-10: 0 no support provided; 0.1-2.5 scarce support; 2.5-4; 4-6; 7-8; 9-10 excellent support)
Vavpotic and Bajec (Vavpotic and Bajec, 2009)	Software development methodologies evaluation	1 Assign measurement scales (seven-point Likert scale) to characteristics of social adoption and technical efficiency 2 Omit characteristics and items that are irrelevant 3 Calculate Cronbach alpha coefficients
Vlahavas, Stamelos, Refanidis and Tsoukias (Vlahavas, 1999)	Expert system for software evaluation (ESSE)	1 Define evaluation alternatives 2 Define type of evaluation (choice, classification, sorting and description) 3 Define evaluation attribute tree (compound and sub-attributes) 4 Define measurement methods (arithmetic or nominal values) 5 Define set of measurement scales (ordinal) 6 Define set of preference structure rules 7 Select appropriate aggregation method (algorithm: multiple attribute utility method, outranking method and interactive method)
Wang and Chen (Wang and Chen, 2007)	Model for prioritized multi-criteria decision making	1 Define alternatives and sets of criteria (each set of criteria has an equal priority) 2 Assign degree of satisfaction (via weighted averaging or quantifier guided OWA) 3 Evaluate alternatives according to objective: a Degree of satisfaction as high as possible b Degree of satisfaction has at least a degree of k
Yan and Huynh (Yan et al., 2011)	Discrete multi-criteria decision making	1 Define set of alternatives and set of criteria (n criteria versus m alternatives) 2 Calculate degree of satisfaction per alternative (all criteria or specific criterion fulfilled) using OWA operator for weighting vector to consider different importance levels

Table 1: Overview of ISR literature on WSM.

The overall objective is to find a CRM system that can be (Gray, 2010):

1. Applied to a particular company context
2. Used to identify modifications that can compensate for missing functionality

3. Used to assess alternatives holistically on a basis of costs versus utility

4 Applying the WSM for CRM System Decision Problems

Selecting a CRM software system can be defined as a MCDM problem. Alternatives in the proposed framework are commercial off the shelf (COTS) solutions, which are weighted by functional, technical, cost and quality criteria (Lee 2004). According to earlier research, the average budget for CRMSS is US$ 10,000 to US$ 50,000 and for CRM implementation, US$ 100,000 to US$ 250,000 (blinded for review). Larger companies tend to spend up to US$ 2 million. The software system purchase and selection process represents the most critical part of the IT implementation (Gray, 2010).

General problems in IS system selection including (Breslin, 1986):

- Definitions are not uniform: Some terms are defined differently depending on industry (for example "on hand balance") and may therefore be interpreted differently.
- Requirements are relative: Again, depending on the industry or field of work, criteria are rated differently.
- Functionality is relative: Functionality is implemented differently in IS and might not cover all requirements.

In the case of CRMSS, the authors suggest a framework described in Figure 1 to apply the WSM. The five steps are derived from the literature review in section 3. Subsections 4.1 to 4.5 describe each step in more detail.

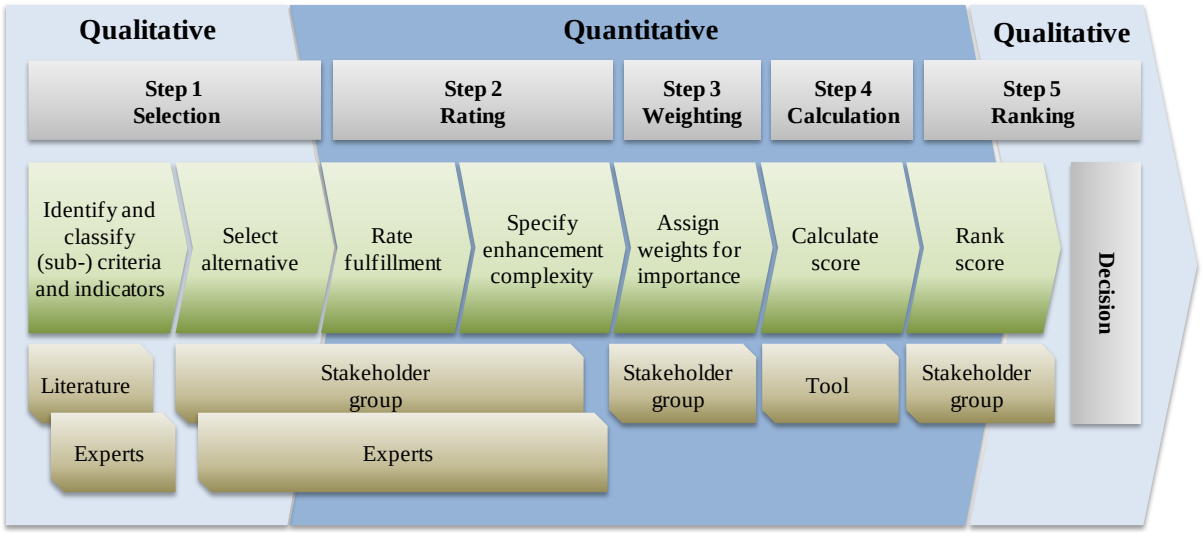

Figure 1: Decision support framework for customer relationship management system selection.

4.1 Step 1 – Selection

MCDM problems deal with multiple decision criteria, which are represent different aspects of alternatives. The first step is to select the relevant decision criteria in all areas. Evaluation criteria cannot exclusively focus on functional requirements, although these are critical. Four categories must be considered for CRMSS: functional fit, quality aspects, technical considerations and costs. All categories are split up into further criteria and sub-criteria with indicators. Quality criteria cover the requirements that measure the quality of the vendor and its product; functional criteria determine the functional fit; costs include all software-related expenses (incl. implementation costs); and technical requirements reflect technical characteristics from hard- and software to data integration.

Figure 2 shows an excerpt of the CRM criteria catalogue for the relevant categories with a detailed view of functionality criteria, particularly the area of sales force automation, as well as indicators of its

sub-criterion, lead management. The criteria list is generally applicable, but each alternative must be rated according to the expectations of the individual case. This list must be enhanced with industry-specific criteria, as well as company-specific requirements.

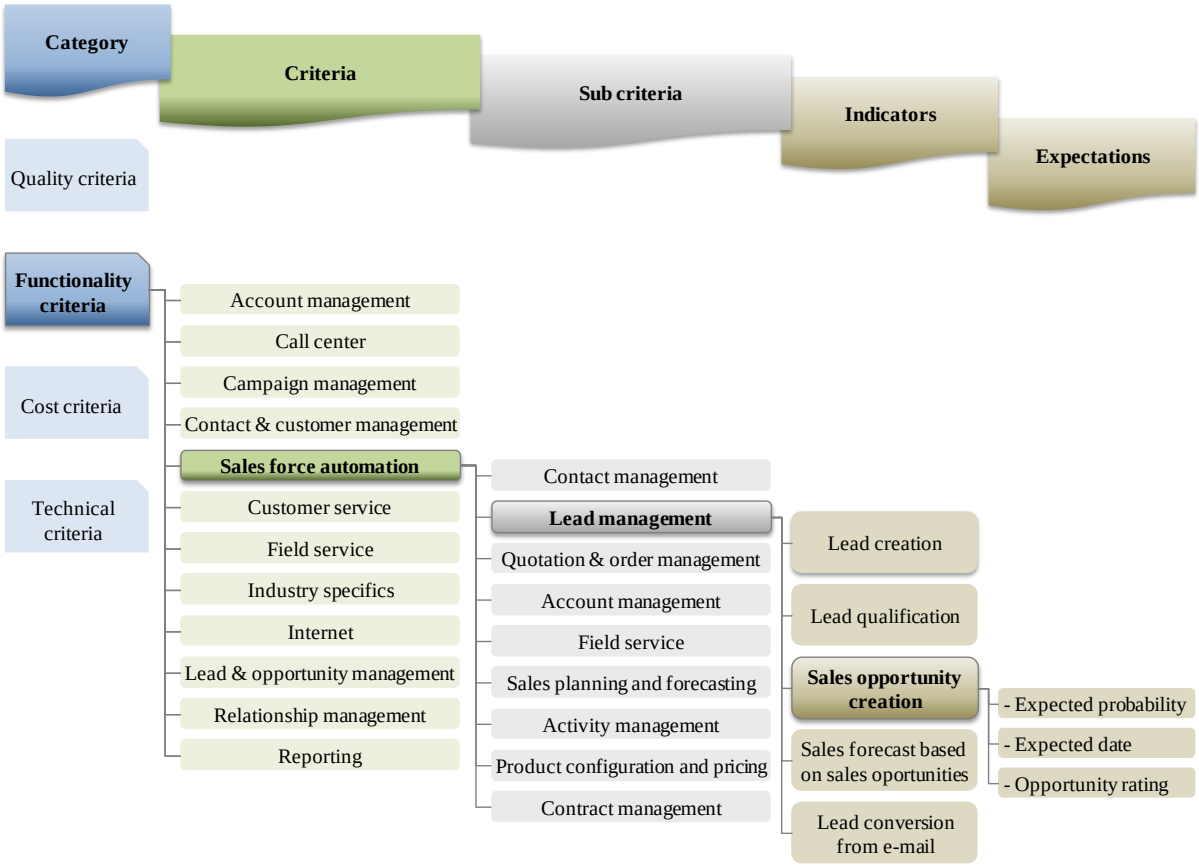

Figure 2: CRM criteria catalogue excerpt.

All of the criteria dimensions mentioned here, together with the criteria, sub-criteria and indicators presented were evaluated during three different renowned CRM expert evaluations and an extended literature review (blind review 2010, 2011 and 2012).

Once the criteria list is complete, the alternative selection must be made. The market of CRM systems packages is dominated by Microsoft CRM, SAP, Oracle Siebel and Salesforce. Depending on the individual CRM strategy, these alternatives must be expanded, e.g. automotive solutions include Detecon, Dealersocket and Autobase.

4.2 Step 2 – Rating

Each CRM system software fulfils the listed criteria to a certain degree. This fulfilment level is applied generally, but must be validated according to the company's expectations. For instance, for sales opportunity creation, a lead must be classified using expected probability, expected date of sale and an opportunity rating to fulfil the specifications of pipeline reporting (see Figure 2). The detailed requirements are only partially covered for some alternatives. The examples of the rating scale and specification of enhancement complexity are presented in Table 2 and Table 4.

To rate the fulfilment level, the rating not only must take the degree of coverage into account, it must also include the complexity of enhancing the feature to the expected level. The effort required for enhancement varies by CRM system software. For example, complex enhancements in SAP result in higher efforts than in Microsoft Axapta. The implementation of a coefficient that helps to take enhancement complexity into account minimizes possible errors in choosing the wrong alternative.

4.3 Step 3 – Weighting

The relative importance of each criterion cannot be assigned before all alternatives are selected and rated to prevent results from affecting the rating of further alternatives. Especially when adding industry-specific alternatives, the criteria catalogue is extended, which has an impact on results and preferences. The allocated weights must be hidden throughout the whole process so as not to influence the judgement of the person conducting the evaluation.

The example weighting scale for measuring criteria importance is presented in Table 3. The scores increase to reflect the level of importance (Breslin, 1986). The sum of all category weights must equal 100 per cent.

Featured	Rating
Yes	6
Substantially	4
Partly	2
No	0

Table 2: Rating of feature fulfilment.

Importance	Weight
Essential	5
Important	3
Nice to Have	1
Not Relevant	0

Table 3: Weighting of criteria importance.

Enhancement complexity	Coefficient
Easy	3
Moderate	2
Difficult	1
Not possible	0

Table 4: Specification of enhancement complexity.

4.4 Step 4 – Calculation

Once the values have been assigned to feature fulfilment, enhancement complexity and criteria importance, the CRM selection tool calculates the performance of each criterion for each alternative. Figure 3 gives an overview of the variables used for a calculation and also illustrates formalised results.

Let $A = \{A_1, A_2 ...., A_N,\}$ specify a set of alternatives. Then the score for the criteria indicator z of the alternative A_j is calculated as follows:

$$s_{zj}^{indicator} = w_z^{indicator} \cdot r_{zj}^{indicator} \cdot c_{zj}^{indicator};\ z \in (1,k),\ j \in (1,N) \quad (1)$$

$r_{zj}^{indicator}$ and $c_{zj}^{indicator}$ denote rating of feature fulfilment and coefficient of enhancement complexity, respectively for the z^{th} indicator of j^{th} alternative. k and N are the numbers of indicators and alternatives. $w_z^{indicator}$ describes the importance weight of the indicator z and is identical for all alternatives. After all indicator scores are calculated, the next computation of the weighted means occurs on the sub-criteria level:

$$m_{yj}^{sub-criterion} = \frac{\sum_{z=1}^{k} s_{zj}^{indicator}}{\sum_{z=1}^{k} w_z^{indicator}};\ y \in (1,v),\ j \in (1,N) \quad (2)$$

$m_{yj}^{sub-criterion}$ presents the weighted mean for the y^{th} sub-criterion of j^{th} alternative and is used next to calculate the score of this sub-criterion:

$$s_{yj}^{sub-criterion} = w_y^{sub-criterion} \cdot m_{yj}^{sub-criterion},\ y \in (1,v),\ j \in (1,N) \quad (3)$$

Aggregated scoring					Alternative											
					A_1				A_2				A_N			
Category	Criteria	Subcriteria	Indicator	Weight	Rating	Coefficient	Weighted mean	Score	Rating	Coefficient	Weighted mean	Score	Rating	Coefficient	Weighted mean	Score
Category 1				$w_1^{category}$			$m_{11}^{category}$	$s_{11}^{category}$			$m_{12}^{category}$	$s_{12}^{category}$			$m_{1N}^{category}$	$s_{1N}^{category}$
	Criterion 1			$w_1^{criterion}$			$m_{11}^{criterion}$	$s_{11}^{criterion}$			$m_{12}^{criterion}$	$s_{12}^{criterion}$			$m_{1N}^{criterion}$	$s_{1N}^{criterion}$
		Subcriterion 1		$w_1^{subcriterion}$			$m_{11}^{subcriterion}$	$s_{11}^{subcriterion}$			$m_{12}^{subcriterion}$	$s_{12}^{subcriterion}$			$m_{1N}^{subcriterion}$	$s_{1N}^{subcriterion}$
			Indicator 1	$w_1^{indicator}$	$r_{11}^{indicator}$	$c_{11}^{indicator}$		$s_{11}^{indicator}$	$r_{12}^{indicator}$	$c_{12}^{indicator}$		$s_{12}^{indicator}$	$r_{1N}^{indicator}$	$c_{1N}^{indicator}$		$s_{1N}^{indicator}$
			Indicator 2	$w_2^{indicator}$	$r_{21}^{indicator}$	$c_{21}^{indicator}$		$s_{21}^{indicator}$	$r_{22}^{indicator}$	$c_{22}^{indicator}$		$s_{22}^{indicator}$	$r_{2N}^{indicator}$	$c_{2N}^{indicator}$		$s_{2N}^{indicator}$
			...													
			Indicator k	$w_k^{indicator}$	$r_{k1}^{indicator}$	$c_{k1}^{indicator}$		$s_{k1}^{indicator}$	$r_{k2}^{indicator}$	$c_{k2}^{indicator}$		$s_{k2}^{indicator}$	$r_{kN}^{indicator}$	$c_{kN}^{indicator}$		$s_{kN}^{indicator}$
		Subcriterion 2		$w_2^{subcriterion}$			$m_{21}^{subcriterion}$	$s_{21}^{subcriterion}$			$m_{22}^{subcriterion}$	$s_{22}^{subcriterion}$			$m_{2N}^{subcriterion}$	$s_{2N}^{subcriterion}$
		...														
		Subcriterion m		$w_m^{subcriterion}$			$m_{m1}^{subcriterion}$	$s_{m1}^{subcriterion}$			$m_{m2}^{subcriterion}$	$s_{m2}^{subcriterion}$			$m_{mN}^{subcriterion}$	$s_{mN}^{subcriterion}$
	Criterion 2			$w_2^{criterion}$			$m_{21}^{criterion}$	$s_{21}^{criterion}$			$m_{22}^{criterion}$	$s_{22}^{criterion}$			$m_{2N}^{criterion}$	$s_{2N}^{criterion}$
	...															
	Criterion p			$w_p^{criterion}$			$m_{p1}^{criterion}$	$s_{p1}^{criterion}$			$m_{p2}^{criterion}$	$s_{p2}^{criterion}$			$m_{pN}^{criterion}$	$s_{pN}^{criterion}$
Category 2				$w_2^{category}$			$m_{21}^{category}$	$s_{21}^{category}$			$m_{22}^{category}$	$s_{22}^{category}$			$m_{2N}^{category}$	$s_{2N}^{category}$
...																
Category x				$w_x^{category}$			$m_{x1}^{category}$	$s_{x1}^{category}$			$m_{x2}^{category}$	$s_{x2}^{category}$			$m_{xN}^{category}$	$s_{xN}^{category}$

Figure 3: Generic layout of CRMSS tool.

The number of sub-criteria as well as of weighted means and scores for these sub-criteria is equal v for every available alternative. Note that the importance weight given to sub-criterion y $(w_y^{sub-criterion})$ is used to calculate the sub-criterion score in (3). When the weighting of the sub-criterion changes, this change is independent from the alternative and a new value of the weight is the same for all alternatives. The same applies to the weights of indicators, criteria and categories. In (4) - (7) the calculation of criterion and category weighted means and scores are given analogue to those of sub-criteria. The only difference is the number of criteria and categories, which are p and u in this case.

$$m_{tj}^{criterion} = \frac{\sum_{y=1}^{v} s_{yj}^{sub-criterion}}{\sum_{y=1}^{v} w_y^{sub-criterion}};\ t \in (1, p),\ j \in (1, N) \tag{4}$$

$$s_{tj}^{criterion} = w_t^{criterion} \cdot m_{tj}^{criterion};\ t \in (1, p),\ j \in (1, N) \tag{5}$$

$$m_{uj}^{category} = \frac{\sum_{t=1}^{p} s_{tj}^{criterion}}{\sum_{t=1}^{p} w_t^{criterion}};\ u \in (1, x),\ \ j \in (1, N) \tag{6}$$

$$s_{uj}^{category} = w_u^{category} \cdot a_{uj}^{category};\ u \in (1, x),\ \ j \in (1, N) \tag{7}$$

4.5 Step 5 – Ranking

To obtain a final ranking of the selected alternatives, the results are summarised and the percentage fit is calculated.

- Total score per alternative (TS_j) is a sum of all category scores. According to the variables in the previous sub-section, the calculation is as follows:

$$TS_j = \sum_{u=1}^{x} s_{uj}^{category};\ j \in (1, N) \tag{8}$$

Different results should be calculated to get an overall impression of fit. The following results are suggested (Breslin, 1986):

- Category percentage fit $(CPT_{uj}^{category})$: The criteria scores for quality, functionality, cost and technical are totalled and then divided by the sum of maximum achievable scores with regard to feature fulfilment and enhancement complexity $(ms_{tj}^{criterion})$.

$$CPT_{uj}^{category} = \frac{\sum_{t=1}^{p} s_{tj}^{criterion}}{\sum_{t=1}^{p} ms_{tj}^{criterion}} \cdot 100\%;\ u \in (1, x),\ j \in (1, N) \tag{9}$$

- Essential feature fit (EFF_j): The scores of all criteria that are marked as essential are totalled $(s_j^{essential-criterion})$ and divided by the sum of the corresponding maximum achievable scores $(ms_j^{criterion})$.

$$EFF_j = \frac{\sum_{1}^{h} s_j^{essential-criterion}}{\sum_{1}^{h} ms_j^{criterion}} \cdot 100\%;\ j \in (1, N), \text{ with } h \text{ - number of all essential criteria} \tag{10}$$

- Total percentage fit (TPF_j): All category scores are totalled and divided by the sum of maximal achievable scores per category $(ms_{uj}^{category})$.

$$TPF_j = \frac{\sum_{u=1}^{p} ms_{uj}^{category}}{\sum_{u=1}^{p} s_{uj}^{category}} \cdot 100\%;\ u \in (1, x),\ j \in (1, N) \tag{11}$$

Figure 4 illustrates an example for the aggregated scoring of an individual company. In this example, the number of categories and alternatives both equal 4. The tool indicates that in this example, the best overall fit is alternative 4. Nevertheless, alternative 3 fulfils all absolutely essential criteria better than alternative 4.

Results vary according to importance weights, individual feature fulfilment, and the enhancement coefficient. Therefore, the preference for specific CRM system software is not a constant outcome. An ideal solution meets all criteria categories at 100%, but in reality, that is rarely the case. A good solution must cover at least a certain percentage; otherwise additional alternatives need to be considered. If the minimal TPF must be 80%, alternative 1 is not a satisfactory solution for the presented example company, even if the cost/usability ratio is the lowest of all other alternatives.

Finally, to comply with objective three (assess alternatives holistically on the basis of costs versus utility), the overall score must be divided by the overall cost of each alternative (Le Blanc and Jelassi, 1989). One method that is often applied is the calculation of the total cost of ownership (TCO). In this calculation, all direct and indirect costs of system software that is in scope are determined and totalled.

Aggregated scoring					Alternative																					
					A_1: Microsoft Dynamics 4.0						A_2: SAP CRM 7.0						A_3: Oracle, Siebel						A_4: Salesforce					
Category	Criteria	Subcriteria	Indicator	Weight	Rating	Coefficient	Weighted mean	Score	Category essential feature fit	Category percentage fit	Rating	Coefficient	Weighted mean	Score	Category essential feature fit	Category percentage fit	Rating	Coefficient	Weighted mean	Score	Category essential feature fit	Category percentage fit	Rating	Coefficient	Weighted mean	Score	Category essential feature fit	Category percentage fit
Quality criteria				10%			12,55	1,25					13,71	1,37					14,65	1,46					13,98	1,40		
	Popularity			Not Relevant			5,46	0,00					6,62	0,00					8,63	0,00					9,09	0,00		
	Portability			Important			15,81	47,43					9,28	27,84					11,52	34,56					16,23	48,69		
	Project management			Essential			16,17	80,85					16,21	81,05					17,13	85,65					15,99	79,95		
	Resources			Important			10,20	30,60	**69,74%**	**69,70%**			13,00	39,00	**84,64%**	**76,15%**			10,41	31,23	**94,35%**	**88,55%**			16,00	48,00	**73,08%**	**77,67%**
	Security			Essential			9,37	46,85					14,27	71,35					16,44	82,20					13,44	67,20		
	Timeliness			Important			12,66	37,98					11,33	33,99					8,96	26,88					17,34	52,02		
	Training & support			Nice to Have			9,32	9,32					5,69	5,69					7,11	7,11					7,60	7,60		
	Usability			Essential			10,31	51,55					13,34	66,70					17,81	89,05					8,63	43,15		
	User acceptance			Essential			14,36	71,80					17,12	85,60					16,55	82,75					14,56	72,80		
Functionality criteria				40%			12,69	5,08					10,64	4,25					15,50	6,20					15,28	6,11		
	Account management			Essential			11,20	56,00					17,00	85,00					16,84	84,20					14,50	72,50		
	Call center			Important			7,00	21,00					11,52	34,56					6,12	18,36					17,84	53,52		
	Campaign management			Important			10,31	30,93					6,20	18,60					10,20	30,60					17,66	52,98		
	Contact & customer manager			Essential			12,10	60,50					10,10	50,50					15,95	79,75					17,83	89,15		
	Customer service			Essential			16,00	80,00					18,00	90,00					17,99	89,95					14,44	72,22		
	Field service			Nice to Have			14,25	14,25					13,50	13,50					18,83	18,83					15,33	15,33		
	Industry specifics			Essential			16,00	80,00					6,00	30,00					16,44	82,22					14,44	72,22		
	Internet			Essential			11,74	58,70					10,96	54,78					16,61	83,04					12,52	62,61		
	Lead & opportunity managen			Important			15,69	47,08					8,08	24,23					16,62	49,85					17,31	51,92		
	Relationship management			Important			16,22	48,67					7,11	21,33					16,44	49,33					16,44	49,33		
	Reporting			Important			7,58	22,74					7,05	21,16					15,68	47,05					14,11	42,32		
	Sales force automation			Essential			12,79	63,93	**70,92%**	**70,51%**			9,13	45,64	**59,09%**	**59,09%**			15,94	79,68	**90,87%**	**86,10%**			13,74	68,70	**81,15%**	**84,88%**
		Contact management		Essential			11,58	57,92					9,8	49,2					20,0	100,0					18,4	92,1		
		Lead management		Important			13,83	41,50					14,5	43,5					16,5	49,5					8,2	24,5		
			Lead creation	Essential	Substa	Moderate		40,00			Yes	Easy		90,0			Yes	Easy		90,0			No	Not possible		0,0		
			Lead qualification	Important	Yes	Easy		54,00			Substar	Easy		36,0			Yes	Easy		54,0			Yes	Moderate		36,0		
			Sales opportunity crea	Important	Yes	Easy		54,00			Yes	Moderate		36,0			Yes	Moderate		36,0			Yes	Easy		54,0		
			Sales forecast based	Nice to Have	Yes	Easy		18,00			Substar	Easy		12,0			Yes	Easy		18,0			Substa	Moderate		8,0		
			Lead conversion	Not Relevant	Partly	Difficult		0,00			No	Difficult		0,0			No	Not possible		0,0			Yes	Easy		0,0		
		Quotation & order manag		Essential			14,67	73,33					8,3	41,7					14,7	73,3					11,7	58,3		
		Account management		Essential			15,39	76,96					9,7	48,7					16,7	83,5					16,7	83,5		
		Field service		Important			12,00	36,00					15,0	45,0					15,0	45,0					15,0	45,0		
		Sales planning and foreca		Important			5,85	17,54					8,8	26,3					14,0	42,0					12,9	38,8		
		Activity management		Important			7,60	22,80					9,7	29,1					15,0	45,0					8,1	24,3		
		Product configuration and		Essential			15,86	79,29					10,9	54,3					16,9	84,6					13,7	68,6		
		Contract management		Essential			13,56	67,78					13,3	0,0					13,3	66,7					14,7	73,3		
Cost criteria				20%			12,45	2,49					14,53	2,91					13,54	2,71					15,43	3,09		
	Maintenance			Important			10,10	30,30					11,23	33,69					10,96	32,88					17,08	51,24		
	Preparation & installation			Essential			10,86	54,30	**74,61%**	**62,88%**			16,31	81,55	**94,14%**	**73,36%**			15,41	77,05	**91,36%**	**68,36%**			15,11	75,55	**89,83%**	**77,92%**
	Resources			Important			13,50	40,50					12,10	36,30					10,03	30,09					17,05	51,15		
	System costs			Essential			16,00	80,00					17,58	87,90					17,48	87,40					17,23	86,15		
	Training & support			Nice to Have			5,89	5,89					7,29	7,29					6,21	6,21					7,05	7,05		
	Upgrade			Important			12,67	38,01					14,59	43,77					12,36	37,08					12,48	37,44		
Technical criteria				30%			11,91	3,57					14,48	4,34					14,29	4,29					16,05	4,81		
	Data integration			Essential			10,60	53,00					16,23	81,15					17,12	85,60					16,69	83,45		
	Deployment			Important			9,02	27,06					12,56	37,68					15,40	46,20					17,60	52,80		
	Integration & infrastructure			Important			12,04	36,12					14,89	44,67					6,09	18,27					17,87	53,61		
	Mobility			Essential			12,10	60,50	**70,24%**	**66,15%**			17,00	85,00	**91,13%**	**80,44%**			16,60	83,00	**93,93%**	**79,38%**			13,50	67,50	**85,56%**	**89,16%**
	Modifiability (scalability) & m			Essential			15,23	76,15					15,98	79,90					17,00	85,00					16,01	80,05		
	Performance & practicability			Important			9,87	29,61					6,23	18,69					15,40	46,20					14,65	43,95		
	Reliability & robustness			Important			14,16	42,48					17,57	52,71					9,60	28,80					18,00	54,00		
	Scalability			Not Relevant			10,60	0,00					6,03	0,00					7,10	0,00					16,78	0,00		
	Software & hardware require			Nice to Have			8,47	8,47					5,60	5,60					7,02	7,02					14,00	14,00		
Total score							12,39						12,87						14,66						**15,41**			
Essential feature fit							74,33%						68,71%						**91,52%**						79,43%			
Total percentage fit							67,59%						80,42%						80,78%						**84,05%**			
TCO							$67.000						$115.000						$80.000						$100.000			
Cost / usability ratio							$5.406						$8.933						**$5.458**						$6.489			

Figure 4: Example of a proposed CRMSS tool calculation

The TCO per alternative is divided by the total score per alternative (8). An example to accentuate the different results is provided in Figure 4. Although alternative 4 provides the best *TPF* , the cost/ usability ratio reveals that alternative 3 provides a comparable *TPF* and better *EFF* at a considerably lower cost.

5 Discussion – Limitations and Recommendations

As demonstrated in a previous sub-section the results of the WSM tool calculation cannot be the determining factor for the final system software selection (Le Blanc and Jelassi, 1989). That is why the proposed framework also comprised qualitative evaluation within the step of ranking score. This part of evaluation allows the decision-makers not only to compare the calculated results, but to analyse them from different perspectives before making a decision.

Nevertheless, there are too many factors that affect the final outcome of an implementation and strategies might change during evaluation and selection. In addition, the aggregated score depends on the subjective judgement of the evaluation project team, which might change over time, too. The framework accommodates this issue through individual prioritisation of a multitude of indicators in four different dimensions. The authors reduce subjectivity by individual weights on three levels – on the category level (quality, functionality, cost and technical), on the criterion level, and on the sub-criterion level (see Figure 4). The results of the framework are only meaningful for a particular company at a specific point in time. The scales used for rating and weighting in previous sub-section can be individually chosen. To validate the decision, the framework should be adapted for different scenarios to analyse the robustness of the result.

A further limitation is importance weighting which is conducted by subjective opinion (Bouyssou et al., 2006). Hence the assigned weights are not always reliable, but this drawback also occurs with AHP. Because selecting CRM system based on functional, technical, cost and quality criteria does describe a complex decision problem, WSM is the preferred evaluation technique. Compared to other techniques, it can be applied rather quickly, and produces similar results. The implementation of this technique within a spreadsheet tool makes the proposed framework not only automatable but also easily manageable (Collier et al., 1999). AHP additionally offers rank reversal and HKBS also provides the ability to specify user requirements and indicate the level of requirement fit (Jadhav and Sonar, 2009). But in terms of CRMSS, the added value does not justify the additional time and budget required. Therefore, the authors regard WSM as the best evaluation technique for CRMSS.

6 Conclusion and Outlook

The purpose of this paper was to evaluate WSM as a feasible evaluation technique for CRM system selection conducting a literature review and proposing a framework to support structuring the underlying multi-criteria decision problem. The research includes valuable contributions to the area of software evaluation and answers the research question as follows:

While the framework provides mainly subjective evaluation, it structures the decision process and demonstrates tendencies and specific insights that are otherwise hard to grasp. As shown, WSM technique is easily applicable to CRMSS. The proposed framework presents one way of supporting MCDM providing a CRMSS recommendation. Making a final decision still requires an in-depth analysis of available results to be made by decision-makers. The presented framework provides valuable insight in terms of analysing various aspects that affect the efficiency of a CRM implementation. In addition, the decision is based on meaningful results that can be presented later in the implementation process if the decision is challenged. As the literature review and the following discussion have shown WSM is a feasible evaluation technique as it is easy to apply which is crucial for smaller system software decisions.

According to consulting companies like Deloitte, AT Kearney, and McKinsey, evaluation methods are one of the four major key elements for implementation (Hart et al., 2004). Multi-criteria decision frameworks aid the selection process of CRM systems software in an efficient way. To even better validate the proposed framework, a comprehensive case study should be conducted, preferably in a context where a CRMSS was carried out and the system software has already been implemented for at

least a year. The results achieved by the framework must be compared to the results and outcome of the former CRMSS in an a posteriori analysis and evaluation.

References

Bouyssou, D., Marchant, T., Pirlot, M., Tsoukias, A. and Vincke, P. (2006). Evaluation and decision models with multiple criteria. Springer, New York.

Breslin, J. (1986). Selecting and installing software packages. Quorum, New York.

Chen, I. and Popovich, K. (2003). Understanding customer relationship management (CRM): People, process and technology. Business Process Management Journal, 9(5), 672-688.

Collier, K., Carey, B., Sautter, D. and Marjaniemi, C. (1999). A methodology for evaluation and selecting data mining software. In Proceedings of the 32nd Hawaii International Conference on System Sciences, 1-11.

Colombo, E. and Francalanci, C. (2004). Selecting CRM packages based on architectural, functional, and cost requirements: empirical validation of a hierarchical ranking model. Requirements Engineering, 9(3), 186-203. Springer, London.

Goyal, D. P. and Sharma, S. (2010). Evaluating effectiveness of data mining software for CRM systems. In Proceedings of International Conference on Advanced Information Management and Service, 11-16.

Gray, C. D. (1987). The right choice – a complete guide to evaluating, selecting and installing MRP II software. Oliver Wight Limited Publications.

Hart, S., Hogg, G. and Banerjee, M. (2004). Does the level of experience have an effect on CRM programs? Exploratory research findings. Industrial Marketing Management, 33(6), 549-560.

Jadhav, A. and Sonar, R. (2009). Analytic Hierarchy Process (AHP), Weighted Scoring Method (WSM), and Hybrid Knowledge Based System (HKBS) for software selection: A Comparative Study. In Proceedings of International Conference on Emerging Trends in Engineering and Technology, 991-997.

Le Blanc, L. A. and Jelassi, M. T. (1989). DSS software selection: a multiple criteria decision methodology. Information and Management, 17(1), 49-65.

Lee, H.-S., Shen, P.-D. and Chih, W.-L. (2004). A fuzzy multiple criteria decision making model for software selection. In IEEE International Conference on Fuzzy Systems Proceedings, 3, 1709-1713.

Lin, G. C. I. and Nagalingam, V. (2000). CIM – Justification and optimization. Taylor & Francis, London.

Naumann, J. D. and Palvia, S. (1982). A selection model for systems development tools. MIS Quarterly, 6(1), 39-48.

Neuman, W. L. (2006). Social research methods – qualitative and quantitative approaches, Pearson Education, Boston.

Perez, M and Rojas, T. (1999). Evaluation of workflow-type software products: a case study. Information and Software Technology, 42(8), 489-503.

Vavpotic, D. and Bajec, M. (2009). An approach for concurrent evaluation of technical and social aspects of software development methodologies. Information and Software Technology, 51(2), 528-545.

Vincke, P. (1989). Multicriteria decision-aid, John Wiley & Sons, England.

Vlahavas, I., Stamelos, I., Refanidis, I. and Tsoukias, A. (1999). ESSE: an expert system for software evaluation. Knowledge-Based Systems, 12(4), 183-197.

Wang, C.-H. and Chen, S.-M. (2007). A generalized model for multicriteria decision making. In Proceedings of International Conference on Machine Learning and Cybernetics, 1815-1820.

Yan, H.-B., Huynh, V.-N. and Murai, T. (2011). On prioritized weighted aggregation in multi-criteria decision making. Expert Systems with Applications, 38, 812-823.

Yoon, K. and Hwang, C. (2009). Multiple attribute decision-making: an introduction. Sage, Thousand Oaks

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